

### **REMARKS**

Claims 1-8, 10-14, 16-31, 47 and 48 are pending.

Claims 5-8, 12-14 and 16-31 are allowed.

#### **Response to Examiner's Response to Arguments**

At numbered paragraph 11 on page 7 of the Office Action, the Examiner states that Applicants have argued two points. It is respectfully submitted that the Examiner errs in stating Applicants' arguments.

First, Applicants have not argued, as was stated by the Examiner, that "Scott does not disclose means for determining parallel arc detection of the value of the voltage and current". The Examiner has not cited any specific portion of the previous Amendment to support that position. Actually, what was stated in that Amendment (page 12, lines 7-9) was that "[t]he Examiner further states that Scott does not disclose any means for determining a value of arc fault energy from a value of voltage at a load and a value of current" and (page 13, lines 10-12) (*emphasis original*) that "Itimura et al. adds nothing to Scott regarding the recited means for determining a value of *parallel* arc fault energy from the recited value of voltage *at a load* and the recited value of current." In the present Office Action (page 3, numbered paragraph 6), the Examiner admits that Scott does not disclose "means for determining a value of the parallel arc fault energy from the value of voltage at the load and the value of current [claims 1, 11]". Hence, it is submitted that Applicants' position is clear.

Second, Applicants have not argued that "Itimura does not teach means for determining a value of parallel arc fault energy." Again, the previous Amendment stated (page 13, lines 10-12) (*emphasis original*) that "Itimura et al. adds nothing to Scott regarding the recited means for determining a value of *parallel* arc fault energy from the recited value of voltage *at a load* and the recited value of current." Again, it is submitted that Applicants' position is clear.

Hence, for the above reasons, it is respectfully submitted that the Examiner errs in stating Applicants' arguments.

Next, at numbered paragraph 12 on page 7 of the Office Action, the Examiner traverses the positions that the Examiner stated in numbered paragraph 11 on page 7 of the Office Action. First, the Examiner argues that Scott discloses (col. 6, ll. 64-67 and col. 7, ll. 64-67) means for determining a value of voltage at the load.

A review of Scott show that this position cannot be supported within the context of Applicants' claims. Scott (col. 6, ll. 64-67) deals with the arc detector 70 of Figure

3 of Scott, which is a circuit for a zero-sequence voltage differential method for series arc detection. This is completely different than the refined recital of an apparatus for determining *parallel* arc fault energy.

Scott (col. 7, ll. 64-67) states that:

Accordingly, the circuit of FIG. 3 for series arc detection might be used in combination with the circuit of FIG. 2 for shunt arc detection to provide an arc detection system capable of detecting both types of arcs.

The circuit of Figure 2 of Scott provides differential current shunt arc detection. “Pilot wires” 35,37 are connected from current transformer sensors 30 and 32 and are directed such that their current flow is to either end of a current summing arc detector 36 which will sum these two currents (which flow in opposite directions such that a “current differential” is detected). In the absence of a shunt arc, such as the arc 34, the currents should be equal such that the net output of the current differential sensor 36 will be zero.

At best, Scott (col. 7, ll. 64-67) teaches and suggests that two separate and distinct circuits, namely: (1) the circuit of Figure 3 of Scott; and (2) the circuit of Figure 2 of Scott, might be used such that the circuit 70 of Figure 3 provides series arc detection and the separate and distinct circuit of Figure 2 provides shunt (parallel) arc detection. There is absolutely no teaching or suggestion in Scott, whether taken alone or in combination with any of the references of record, as to how those circuits of Figures 2 and 3 of Scott might be combined to provide the refined recital of Claim 1 of an apparatus for determining *parallel* arc fault energy in real time comprising a means for determining a value of voltage *at a load*. In other words, under the teachings of Scott, the circuit of Figure 2 does not employ any means for determining a value of voltage *at a load*. Instead, it continues to employ the “pilot wires” 35,37 as was discussed, above. Furthermore, the “pilot wires” 64,66 of the separate and distinct circuit 70 of Figure 3 continue to be used for the completely different purpose of series arc detection. Even if those separate and distinct circuits could be combined within the context of Claim 1, although this is not admitted, it is submitted that they could not be combined without great difficulty. It is submitted that only by hindsight with Applicants’ teachings, which is clearly impermissible, could one arrive at the refined recital of Claim 1.

Finally, the Examiner argues that Itimura et al. discloses (col. 12, ll. 61-64) “means for determining a value of the parallel arc fault energy from the value of voltage and the value of current”. Again, as was discussed above in connection with numbered paragraph 11, the Examiner errs in stating Applicants’ argument.

Itimura et al. adds nothing to Scott regarding the recited means for determining a value of **parallel** arc fault energy from the recited value of voltage **at a load** and the recited value of current. Itimura et al. deals with a value of an arc voltage of a generated arc, which is not at a load. Itimura et al. discloses (col. 12, ll. 61-67) that a generated arc energy  $E_a$  of " $E_a = \int i_v dt$ ,  $t$  is a time" on an accident point is obtained, wherein  $i$  represents the instantaneous value of an accident current and  $v_a$  indicates the instantaneous value of an arc voltage of a generated arc. The " $v_a$ " can also be regarded as a constant value  $V_a$  almost irrespective of a time based on the observation. Therefore, " $E_a = V_a \int i dt$ " can be obtained by transformation. Itimura et al. does not teach or suggest use of a value of voltage **at a load**. At best, Itimura et al. teaches and suggests a means for determining a value of virtual arc fault energy from a completely different constant times an integral of a value of current. Accordingly, it is respectfully submitted that the Examiner errs by failing to consider the refined recital of Claim 1.

#### **Rejections under 35 U.S.C. § 103(a)**

Claims 1-4 and 11 are rejected on the ground of being unpatentable over U.S. Patent No. 5,986,860 (Scott) in view of U.S. Patent No. 6,703,842 (Itimura et al.).

Scott (Figure 2) discloses an apparatus and method for only differential current shunt arc detection. "Pilot wires" 35,37 are connected from current transformer sensors 30 and 32 and are directed such that their current flow is to either end of a current summing arc detector 36 which will sum these two currents (which flow in opposite directions such that a "current differential" is detected). In the absence of a shunt arc, such as the arc 34, the currents should be equal such that the net output of the current differential sensor 36 will be zero.

Scott (Figure 3; col. 6, ll. 22-23) discloses a circuit for a zero-sequence voltage differential method for only series arc detection. An arc detector 70 comprises comparing means for comparing the two zero-sequence voltages, that is, the respective sums of the voltages on the pilot wires 64,66 from the load end and source end of the line. Under normal conditions, this zero-sequence voltage arc detector or comparing circuit 70 will produce a difference signal corresponding to any difference between the two zero-sequence voltages at the pilot wires 64,66. If there are no series arcing faults in the monitored phase lines, the difference should ideally be zero.

Scott (Figure 13) discloses a circuit 125 for voltage drop series arc detection. This circuit detects the arc voltage itself, symbolized schematically as  $V_{ARC}$ . This circuit detects series arcs rather than shunt or parallel arcs. These arcs generate frequency

components from DC to the megahertz range and beyond. The arc voltage always opposes the current in the line. The series arc voltage therefore always adds to the line voltage drop such that an unusual increase in voltage drop will indicate an arc in the conductive path. A pilot wire 126 coupled near the load end of the zone feeds one input of an arc detector 128, which may be a voltage detector, for detecting or comparing the voltage on the pilot wire 126 with the voltage at or near the source end of the circuit which is fed to the detector 128 on a line 130. The total voltage drop seen by the detector 128 would then be the line voltage drop due to the nominal line impedance plus the arc voltage. The impedance voltage drop in the line must be subtracted from the total voltage drop at the detector 128 in order to extract the arc voltage.

Scott (Figure 14) shows a circuit 135 for use in a line power loss (arc power) method of arc detection. This method monitors the power loss through a conductor and subtracts out the energy due to resistance. The arc power relates more directly to the potential for equipment damage and other problems, than do other measurements such as arc voltage or arc current alone. The pilot wires or connections 126,130 (as in the circuit of Figure 13) supply the line drop voltage to an arc power sensor type of arc detector circuit 132. A current transformer sensor 134 supplies the current in the line from the source end of the line to the arc power sensor 132. Thus, the current times the total voltage drop may be calculated by the arc power sensor 132 to determine the arc power in the presence of an arcing voltage  $V_{arc}$  in similar form to the arcing voltage indication as discussed above in connection with Figure 13.

Itimura et al. discloses (col. 6, ll. 1-21) that a short-circuit current flowing in a fault circuit ranges widely. Therefore, short-circuit current in the wide range is detected by a combination of the following three kinds of detecting methods. A first method is applied to a comparatively small current, such as a series arc, in which a fluctuation pattern peculiar to an arc current is discriminated by extracting a fluctuation pattern of each continuous half wave of an alternating current. In a second method (Itimura et al., col. 6, ll. 10-15), an instantaneous current value is subjected to sampling at regular intervals as to an arc short circuit of a comparatively small current region, and a virtual arc energy is integrated for a constant period to decide whether or not the integrated value exceeds a predetermined threshold value. In a third method, it is decided whether or not the instantaneous value obtained by the sampling exceeds a "constant number of times a predetermined threshold value" when short circuit phenomena in a comparatively large current region is caused or an overload current is generated.

Itimura et al. discloses (col. 12, ll. 61-67) that a generated arc energy  $E_a$  of “ $E_a = \int i \cdot v_a \cdot dt$ ,  $t$  is a time” on an accident point is obtained, wherein  $i$  represents the instantaneous value of an accident current and  $v_a$  indicates the instantaneous value of an arc voltage of a generated arc. The “ $v_a$ ” can also be regarded as a constant value  $V_a$  almost irrespective of a time based on the observation. Therefore, “ $E_a = V_a \int i \cdot dt$ ” can be obtained by transformation.

Itimura et al. further discloses (col. 13, ll. 1-9) that the arc energy  $E_a$  is proportional to a time integration of the instantaneous value of the accident current  $i$ . The time integral value of  $i$  is approximately represented by an integral value of each sampling value in the case in which the instantaneous value of the accident current is sampled at a proper interval. Although the integral value is not an actual arc energy, it has a value which is almost proportional to a virtual arc energy when an arc voltage is assumed to be constant.

Itimura et al. also discloses (Figure 6, col. 14, l. 65 through col. 16, l. 41) an abnormal current detecting apparatus that employs one of the three kinds of detecting methods. The current of the AC load circuit is detected by current transformer (CT) and is input to two amplifying circuits 12,14 through a load resistor 10 and a filter 11. The amplifying circuits 12,14 have different degrees of amplification and each outputs maximum digital values at 30 A, 300 A respectively when the current is input to low-pass and high-pass current detecting A/Ds of a microcomputer 20. The voltage of the AC load circuit is input to a zero cross comparator 19 through a resistance voltage divider 16, a differential input 17 and a filter 18, and an output repeating 0V and 5V for each zero cross is sent to the voltage detecting input port of the microcomputer 20 respectively. The microcomputer 20 executes a predetermined data processing over the two kinds of current digital values and a voltage zero cross signal in accordance with a predetermined program including plural algorithms prepared in advance for the three kinds of methods, and outputs immediately an accident detection signal when accident detection is decided, namely discriminate abnormal current.

Claim 1 recites, *inter alia*, an apparatus for determining parallel arc fault energy in real time for a power circuit between a power source and a load comprising: means for determining a value of voltage at the load; means for determining a value of current flowing in the power circuit to or from the power source; and means for determining a value of the parallel arc fault energy from the value of voltage at the load and the value of current.

The Examiner states that Scott discloses “means for determining a value of voltage at the load [claims 1, 11] (col. 6, lines 64-67 and col. 7, lines 64-67)”. This statement is traversed as applied to the refined recital of Claim 1 for reasons that were discussed in

detail, above, in connection with the Response to Examiner's Response to Arguments. Scott teaches and suggests that two separate and distinct circuits, namely: (1) the circuit of Figure 3 of Scott; and (2) the circuit of Figure 2 of Scott, might be used such that the circuit 70 of Figure 3 provides series arc detection and the separate and distinct circuit of Figure 2 provides shunt (parallel) arc detection. There is absolutely no teaching or suggestion in Scott, whether taken alone or in combination with any of the references of record, as to how those circuits of Figures 2 and 3 of Scott might be combined to provide the refined recital of Claim 1 of an apparatus for determining *parallel* arc fault energy in real time comprising a means for determining a value of voltage *at a load*.

The Examiner further states that Scott does not disclose any means for determining a value of the parallel arc fault energy from a value of voltage at the load and a value of current.

The Examiner also states that Itimura et al. discloses an apparatus and method for arc detection having "means for determining a value of the parallel arc fault energy from the value of voltage and the value of current [claims 1, 11] (col. 12, line[s] 61-64)". This statement is traversed as applied to the refined recital of Claim 1 for reasons that were discussed in detail, above, in connection with the Response to Examiner's Response to Arguments.

The cited portion of Itimura et al. (col. 12, ll. 61-64) discusses an instantaneous value of an arc voltage of a generated arc. Itimura et al. (col. 12, ll. 65-67) makes clear that such generated arc voltage value is removed from the integration and is assumed to be a constant. The instantaneous value of an arc voltage of a generated arc of Itimura et al. is, however, completely different than the recited value of voltage *at a load*. Furthermore, at column 13, lines 1-40 of Itimura et al., it is explained that the arc energy  $E_a$  is proportional to a time integration of the instantaneous value of the accident current  $i$ . The time integral value of  $i$  is approximately represented by an integral value of each sampling value in the case in which the instantaneous value of the accident current is sampled at a proper interval as determined by the detection of voltage zero crossings. Although the integral value is not an actual arc energy, it has a value which is almost proportional to a virtual arc energy when a generated arc voltage value is assumed to be constant. The alternating current flowing to an AC load circuit is sampled in a predetermined cycle and is converted into a digital value corresponding to an instantaneous current, and an absolute value of the instantaneous value of the current converted into the digital value is integrated within a predetermined restricted section, thereby calculating a virtual arc energy. When the

virtual arc energy value thus calculated exceeds a predetermined threshold, it is decided that an abnormal current is generated.

Itimura et al. does not teach or suggest use of a value of voltage **at a load**. At best, Itimura et al. teaches and suggests a means for determining a value of virtual arc fault energy from a completely different constant times an integral of a value of current.

Accordingly, Itimura et al. adds nothing to Scott regarding the recited means for determining a value of **parallel** arc fault energy from the recited value of voltage **at a load** and the recited value of current.

Therefore, for the above reasons, it is submitted that Claim 1 patentably distinguishes over the references.

Claims 2-4 depend directly or indirectly from Claim 1 and patentably distinguish over the references for the same reasons.

Claim 2 is not separately asserted to be patentable except in combination with Claim 1 from which it depends.

Claim 3 is not separately asserted to be patentable except in combination with Claim 2 (and Claim 1) from which it depends.

Furthermore, Claim 4 recites that the means for determining a value of the parallel arc fault energy includes means for determining a value of parallel arc power from the value of voltage at the load times the value of current, and means for determining the value of the parallel arc fault energy as a function of an integral of the parallel arc power.

The Examiner admits on page 3, last paragraph, of the present Office Action that Scott does not teach this recital.

For similar reasons as were discussed above in connection with Claim 1, since Itimura et al. adds nothing to Scott regarding a means for determining a value of **parallel** arc fault energy from the recited value of voltage **at a load** and the recited value of current, it clearly does not teach or suggest any means for determining a value of parallel arc power from a value of voltage **at a load** times a value of current, and a means for determining such value of such parallel arc fault energy as a function of an integral of such parallel arc power. Again, Itimura et al., which uses a value of voltage of a generated arc, does not teach or suggest the refined recital of a value of voltage **at a load**.

Claim 11 is an independent claim which recites, *inter alia*, a method for determining parallel arc fault energy in real time for a power circuit between a power source and a load comprising: determining a value of voltage at the load; determining a value of

current flowing in the power circuit to or from the power source; and determining a value of the parallel arc fault energy from the value of voltage at the load and the value of current.

The Examiner states that Scott discloses “determining a value of voltage at the load [claims 1, 11] (col. 6, lines 64-67 and col. 7, lines 64-67)”. This statement is traversed as applied to the refined recital of Claim 11 for reasons that were discussed in detail, above, in connection with the Response to Examiner’s Response to Arguments. Scott teaches and suggests that two separate and distinct circuits, namely: (1) the circuit of Figure 3 of Scott; and (2) the circuit of Figure 2 of Scott, might be used such that the circuit 70 of Figure 3 provides series arc detection and the separate and distinct circuit of Figure 2 provides shunt (parallel) arc detection. There is absolutely no teaching or suggestion in Scott, whether taken alone or in combination with any of the references of record, as to how those circuits of Figures 2 and 3 of Scott might be combined to provide the refined recital of Claim 11 of a method for determining *parallel* arc fault energy in real time comprising determining a value of voltage *at a load*.

The Examiner further states that Scott does not disclose any determining a value of the parallel arc fault energy from a value of voltage at the load and a value of current.

The Examiner also states that Itimura et al. discloses an apparatus and method for arc detection “determining a value of the parallel arc fault energy from the value of voltage and the value of current [claims 1, 11] (col. 12, line[s] 61-64)”. This statement is traversed as applied to the refined recital of Claim 11 for reasons that were discussed in detail, above, in connection with the Response to Examiner’s Response to Arguments.

The cited portion of Itimura et al. (col. 12, ll. 61-64) discusses an instantaneous value of an arc voltage of a generated arc. Itimura et al. (col. 12, ll. 65-67) makes clear that such generated arc voltage value is removed from the integration and is assumed to be a constant. The instantaneous value of an arc voltage of a generated arc of Itimura et al. is, however, completely different than the recited value of voltage *at a load*. Furthermore, at column 13, lines 1-40 of Itimura et al., it is explained that the arc energy  $E_a$  is proportional to a time integration of the instantaneous value of the accident current  $i$ . The time integral value of  $i$  is approximately represented by an integral value of each sampling value in the case in which the instantaneous value of the accident current is sampled at a proper interval as determined by the detection of voltage zero crossings. Although the integral value is not an actual arc energy, it has a value which is almost proportional to a virtual arc energy when a generated arc voltage value is assumed to be constant. The



alternating current flowing to an AC load circuit is sampled in a predetermined cycle and is converted into a digital value corresponding to an instantaneous current, and an absolute value of the instantaneous value of the current converted into the digital value is integrated within a predetermined restricted section, thereby calculating a virtual arc energy. When the virtual arc energy value thus calculated exceeds a predetermined threshold, it is decided that an abnormal current is generated.

Itimura et al. does not teach or suggest employing a value of voltage *at a load*. At best, Itimura et al. teaches and suggests determining a value of virtual arc fault energy from a completely different constant times an integral of a value of current.

Accordingly, Itimura et al. adds nothing to Scott regarding the recited determining a value of *parallel* arc fault energy from the recited value of voltage *at a load* and the recited value of current.

Therefore, for the above reasons, it is submitted that Claim 11 patentably distinguishes over the references.

Claims 10, 47 and 48 are rejected on the ground of being unpatentable over Scott in view of Itimura et al. and further in view of U.S. Patent No. 6,654,219 (Romano et al.).

As shown with reference to Figures 1-3 of Romano et al., an arc fault circuit device 1 includes a current sensor 18 for sensing current to load 12. Current sensor 18 is connected to an input 22 of a detector 24. A parallel arc fault 104 occurring across a load 12 is discernable by a sputtering current exceeding 75 amperes, which is sensed by the current sensor 18. Romano et al. further discloses a current sensor 200 (Figure 2) that senses current on another of the conductors and provides a signal to an input 202 of the detector 24 in the same manner as the current sensor 18 provides a signal to the detector input 22. A line to neutral parallel arcing condition 104 is identifiable by detector 24 as a presence of signals from both current sensors 18 and 200. A line to ground parallel arcing condition 204 is identifiable by detector 24 as a signal from only one of sensors 18,200. A voltage sensor 46 is formed by a resistor 46 electrically connected at one end to load terminal 6 of the device 1 and at the other end to the detector 46. Voltage sensor 46 establishes the open or closed status of device contacts 14 and 16 by the presence or absence of voltage, respectively, at the device terminal 6, and communicates the status to an input 44 (Figure 1) of the detector 24.

Romano et al. (col. 8, l. 42 through col. 9, l. 12; Figure 5) further discloses a remote monitoring system including building main M1, breakers B1-B2 and protection devices PD1-PD8 connected to a remote monitoring device RM1. The remote monitoring

device RM1 is preferably located in the building within a security monitoring room or co-located with the building's fire alarm control panel (FACP). The connections can be via signal wires in a similar fashion as FACP's are connected to fire alarm pull boxes and smoke detectors. Another optional connection could be done via power line communication technology, although this method of connection has the disadvantage that the arc fault itself can disrupt the signal. The signals are the encoded output signals from detector 24 (Figures 1-3 of Romano et al.), which can be binary, hex or ASCII coded signals. A remote monitor RM2 is shown connected to remote monitor RM1 via the Internet. ASCII coded signals from the detector 24 sent via the Internet would permit monitoring the status of the various devices anywhere in the world by a monitoring or security service. In this case, remote monitor RM1 preferably acts as the Internet interface. Thus, the encoded output signal from the detector 24 permits diagnosing the type and probable location of the fault at remote monitor RM1 and/or remote monitor RM2.

It is submitted that Romano et al., which detects a parallel arc fault 104 by sensing with a current sensor 18, which detects a line to neutral parallel arcing condition 104 from the presence of signals from both of two current sensors 18,200, and which detects a line to ground parallel arcing condition 204 from a signal from only one of two current sensors 18,200, adds nothing to Scott and Itimura et al. regarding any means for determining a value of *parallel* arc fault energy from a recited value of voltage *at a load* and the recited value of current to render Claim 1 unpatentable.

Claims 10, 47 and 48 depend directly or indirectly from Claim 1, include all of the limitations thereof, and patentably distinguish over the references for the same reasons.

The Examiner admits that the combined teachings of Scott and Itimura et al. "fails to disclose" the refined recitals of Claims 10, 47 and 48. Claim 10 recites that the means for determining a value of voltage at the load includes means for remotely communicating the value of voltage at the load to the means for determining a value of the parallel arc fault energy. Romano et al., which employs an internal resistor 46 electrically connected to a load terminal 6 of an arc fault circuit device 1, does not teach or suggest any means for *remotely* communicating a value of voltage *at a load* to a means for determining a value of parallel arc fault energy.

Here, the Examiner relies upon Romano et al. (col. 8, ll. 55-58) ("Building main M1, breakers B1-B2, and protection devices PD1-PD8 are preferably connected to a remote monitoring device RM1 as shown in FIG. 5 by the dashed lines. Remote monitoring device RM1 is preferably located in the building within a security monitoring room or co-

located with the building's fire alarm control panel (FACP).”). At best, this structure provides a line voltage from building main M1, to breakers B1-B2, to protection devices PD1-PD8. This has nothing to do with any means for remotely communicating a value of voltage **at a load**. Hence, it is submitted that Claim 10 further patentably distinguishes over the references.

Furthermore, Claim 47 recites that the means for determining a value of voltage at the load includes means for remotely communicating the value of voltage at the load by encoding the value of voltage through a power line carrier signal to the means for determining a value of the parallel arc fault energy.

Here, the Examiner relies upon Romano et al. (col. 8, l. 65 through col. 9, l. 3) (“Another optional connection could be done via power line communication technology, although this method of connection has the disadvantage that the arc fault itself can disrupt the signal. The signals are the encoded output signals from detector 24, which can be binary, hex, or ASCII coded signals.”). It is respectfully submitted that this reliance is misplaced since the power line communication technology signals are output signals from detector 24. This does not teach or suggest any means for remotely communicating a value **to** a means for determining a value of parallel arc fault energy. Furthermore, as made clear by Romano et al. (col. 9, ll. 9-12), the encoded output signal from the detector 24 permits diagnosing the type and probable location of the fault at the remote monitors RM1, RM2. This has nothing to do with any means for remotely communicating **a value of voltage at a load** by encoding **a value of voltage** through a power line carrier signal **to** a means for determining a value of parallel arc fault energy. Therefore, it is submitted that Claim 47 further patentably distinguishes over the references.

Furthermore, Claim 48 recites that the means for determining a value of voltage at the load includes means for remotely communicating the value of voltage at the load by encoding the value of voltage as a current through a power line carrier current signal to the means for determining a value of the parallel arc fault energy.

Here, the Examiner relies upon Romano et al. (col. 9, ll. 8-12) (“In this case, remote monitor RM1 preferably acts as the Internet interface. Thus, the encoded output signal from detector 24 permits diagnosing the type and probable location of the fault at remote monitor RM1 and/or remote monitor RM2.”). Claim 48 further patentably distinguishes over the references for similar reasons as were discussed above in connection with Claim 47. Furthermore, as made clear by Romano et al. (col. 9, ll. 9-12), the encoded output signal from the detector 24 permits diagnosing the type and probable location of the

fault at the remote monitors RM1, RM2. This has nothing to do with any means for remotely communicating *a value of voltage at a load* by encoding *a value of voltage as a current* through a power line carrier current signal *to* a means for determining a value of a parallel arc fault energy. Therefore, it is submitted that Claim 48 further patentably distinguishes over the references.

**Allowable Subject Matter**

It is noted with appreciation that the Examiner states that Claims 5-8, 12-14 and 16-31 are allowed.

**Summary and Conclusion**

In summary, it is submitted that Claims 1-8, 10-14, 16-31, 47 and 48 are patentable over the references of record.

Reconsideration and early allowance are requested.

Respectfully submitted,



Kirk D. Houser  
Attorney for Applicants  
Registration No. 37,357

(412) 566-6083